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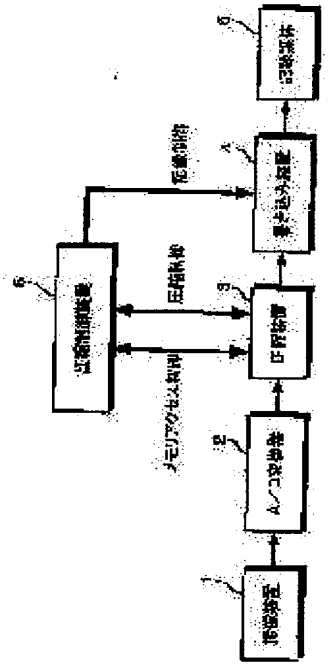
(54) IMAGE RECORDER AND METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an image recorder that applies compression coding to a dynamic image, records the compression-coded data onto a recording medium and also generates a reduced image.
SOLUTION: An image signal photographed by an image pickup device 1 is converted into a digital signal, a compressor 3 compresses the digital image signal, and a writer 4 records a coded bit stream to a recording medium 5. At the same time as compression coding and recording processing are applied to the received image, a compression controller 6 accesses a frame memory in the compressor 3, generates a reduced image from the received image extracted at an interval of a prescribed frame number from the start of photographing and stores the generated reduced image to a memory area reserved in the frame memory. At the end of photographing, the generated reduced image is compression-coded. The recording medium 5 records the reduced image data that are compression-coded. Generation, coding and recording processing of the reduced image are conducted automatically.



* NOTICES *

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2.**** shows the word which can not be translated.
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CLAIMS

[Claim(s)]
[Claim 1]An image recorder which carries out compression encoding of the video and is recorded on a recording medium, comprising:
An encoding means which carries out compression encoding of the inputted image.
A recording device which records compression coded data generated by the above-mentioned encoding means on a recording medium.
A picture generation means which extracts 1 or two or more pictures from the above-mentioned inputted image, and generates a reduction image of the above-mentioned inputted image from 1 extracted or two or more pictures simultaneously with record to a recording medium of the above-mentioned compression coded data.

[Claim 2]An image recorder, wherein a picture which has a photographing device and was further photoed by the above-mentioned photographing device in claim 1 is inputted.
[Claim 3]An image recorder characterized by carrying out compression encoding of the above-mentioned reduction image in claim 1 at the time of an end of compression and recording processing to a series of inputted images.
[Claim 4]An image recorder performing compression processing of a reduction image which was generated in addition to generation of the above-mentioned reduction image in claim 1 simultaneously with record to a recording medium of the above-mentioned compression coded data.
[Claim 5]An image recorder recording compression coded data of the above-mentioned reduction image on the above-mentioned recording medium or other recording media in claim 3 or 4.
[Claim 6]An image recorder transmitting compression coded data of the above-mentioned reduction image in claim 3 or 4 using communication media.
[Claim 7]An image recorder performing record to a recording medium of the above-mentioned compression coded data, record of a reduction image in which it was compression-processed and a reduction image which was generated in addition to generation of the above-mentioned reduction image was compressed simultaneously, or transmitting processing in claim 1.
[Claim 8]An image recorder generating the above-mentioned reduction image in claim 1 from a picture of one sheet of a head in case a described image creating means starts compression and recording processing of video.
[Claim 9]An image recorder generating the above-mentioned reduction image from two or more extracted pictures in claim 1, respectively while a described image creating means performs compression and recording processing of video.
[Claim 10]An image recorder, wherein an interval which extracts two or more pictures in claim 9 is a constant interval.
[Claim 11]In claim 1, in order that the above-mentioned encoding means may perform compression encoding, it has a memory in which an inputted image is stored, On the above-mentioned memory, a memory area for the above-mentioned reduction image processing is secured, and the generated above-mentioned reduction image is stored at the above-mentioned

memory area, An image recorder carrying out compression encoding of the above-mentioned reduction image read from the above-mentioned memory area at the time of an end of compression and recording processing to a series of inputted images, and recording or transmitting compression coded data.

[Claim 12]In claim 1, in order that the above-mentioned encoding means may perform compression encoding, it has a memory in which an inputted image is stored, On the above-mentioned memory, a memory area for the above-mentioned reduction image processing is secured, and compression coded data of the generated above-mentioned reduction image is stored at the above-mentioned memory area, An image recorder recording or transmitting compression coded data of the above-mentioned reduction image read from the above-mentioned memory area at the time of an end of compression and recording processing to a series of inputted images.

[Claim 13]In claim 11 or 12, when capacity of a memory area for the above-mentioned reduction image processing runs short, An image recorder reading data which overwrote new data, and read data first written to the eventh and odd-numbered another side on data written to odd Either the eventh or-numbered, next was written to odd Either the eventh or-numbered.

[Claim 14]A method for recording image which carries out compression encoding of the video and is recorded on a recording medium, comprising:

A step which carries out compression encoding of the inputted image.

A step which records generated compression coded data on a recording medium.

A step which extracts 1 or two or more pictures from the above-mentioned inputted image, and generates a reduction image of the above-mentioned inputted image from 1 extracted or two or more pictures simultaneously with record to a recording medium of the above-mentioned compression coded data.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the recorder and record method which compress the picture signal of the video photoed, for example, and are recorded on a recording medium.
[0002]
[Description of the Prior Art]In the digital still picture camera, the reduction image (a thumbnail image is called) of the recorded picture is generated, and what is recorded as an object for indexes is known. In the case of the still picture camera, it was able to afford [time / enough] to perform processing for generating a thumbnail image. It is possible to generate the picture for thumbnails again from the video series once recorded on the tape in the case of the animation camera which uses a tape as a recording medium. However, it cannot be said that it is practical to search a desired picture with reference to a thumbnail image triggered by inconvenient [of the access nature of a tape].
[0003]
[Problem(s) to be Solved by the Invention]However, in a disk and the animation camera which uses semiconductor memory as a recording medium, also in order to fully use effectively the random access nature which is the feature, the search and search of a video series which were recorded become an important function. Also in order for a user to know the contents of each video series quickly in that case, generation of thumbnail video is important. However, the technique of remaking the picture for thumbnails again from the data once recorded on the disk etc. had a problem which time and effort and time require.
[0004]Therefore, the purpose of this invention is to provide the image recorder and method which were made possible [saving the time and effort and time for generating a thumbnail image] by generating a thumbnail image simultaneously at the time of animation photography.
[0005]
[Means for Solving the Problem]In order to solve a technical problem mentioned above, an invention of claim 1, In an image recorder which carries out compression encoding of the video and is recorded on a recording medium, An encoding means which carries out compression encoding of the inputted image, and a recording device which records compression coded data generated by encoding means on a recording medium, It has a picture generation means which extracts 1 or two or more pictures from an inputted image, and generates a reduction image of an inputted image from 1 extracted or two or more pictures simultaneously with record to a recording medium of compression coded data.
[0006]In a method for recording image which an invention of claim 14 carries out compression encoding of the video, and is recorded on a recording medium, A step which carries out compression encoding of the inputted image, and a step which records generated compression coded data on a recording medium, It has a step which extracts 1 or two or more pictures from an inputted image, and generates a reduction image of an inputted image from 1 extracted or two or more pictures simultaneously with record to a recording medium of compression coded data.
[0007]In this invention, it becomes possible to generate automatically a reduction image of a picture taken out from an inputted image series simultaneously with compression and recording

processing of an inputted image. Therefore, when it becomes unnecessary to newly take procedure of reduction image generation later and reproduces later, an outline of a photographing content can be easily grasped by referring to an animation series of a reduction image.

[0008]

[Embodiment of the Invention]Hereafter, one embodiment of this invention is described. In an example like the camera which photos and records video, one embodiment incorporates a thumbnail image generation function into the image compression system which records the data which performed compression encoding on a recording medium.

[0009]Drawing 1 shows the composition of the whole video compression recorder of one embodiment. In drawing 1, it is an imaging device with which 1 consists of an optical system of image sensors, such as CCD, a lens, etc., and 2 is an A/D converter which digitizes the picture signal photoed by the imaging device 1. The picture signal digitized with A/D converter 2 is inputted into the compression equipment 3. And compression encoding of the picture signal is carried out in the compression equipment 3, and a bit stream is generated. This bit stream is recorded on the recording media 5, such as an optical disc, a magnetic disk, and semiconductor memory, by the writing device 4. As the recording medium 5, the thing excellent in random access nature is preferred. The compression control device 6 mainly controls a start, stop, etc. of the thumbnail image generation by access with an exchange of the encoding parameter between the compression equipments 3, and the frame memory in the compression equipment 3, and record to the writing device 4.

[0010]The example of composition shown in drawing 1 corresponds, when the application as a digital video camera which carries out record reproduction, for example using a storage medium is mainly assumed.

[0011]Drawing 2 shows the composition of an example of the compression equipment 3 in drawing 1. The digital image signal outputted from A/D converter 2 in drawing 1 is supplied as an input of the compression equipment 3. the bit stream by which compression encoding was carried out based on the parameter for the coding delivered and carried out between the compression control devices 6 is outputted from the compression equipment 3. In addition, the data access for thumbnail reduction image generation is performed from the compression control device 6 to a frame memory. The compression equipment 3 comprises the pretreatment system 7 which performs suitable resolution and pixel number conversion to an inputted image, the motion vector sensing device 8 which calculates inter-frame movement quantity, and the coding equipment 9 which codes and generates a bit stream.

[0012]The pretreatment system 7 comprises the filter arithmetic machine 10 which performs, definition conversion, i.e., frequency characteristic conversion, suitable for the object image which codes the digital image signal inputted according to the instructions from the compression control device 6, and the infanticide treater 11 which performs pixel number conversion, i.e., the number conversion of samplings. By changing the filter factor, using a digital filter for example as an example of various resolution and pixel number conversion in the pretreatment system 7, the pass band characteristic of a frequency component is controlled and there is the technique of performing pixel number conversion by performing definition conversion or thinning out a horizontal pixel.

[0013]Drawing 3 A shows an example of the frequency characteristic of the filter arithmetic machine 10, and drawing 3 B shows other examples. These filter arithmetic machines 10 restrict the zone of a digital image signal as prefilter. In drawing 3, a frequency axis (horizontal axis) shows the normalized frequency normalized with the Nyquist rate. The frequency characteristic shown in drawing 3 A has a pass band larger than the frequency characteristic shown in drawing 3 B.

[0014]The output of the filter arithmetic machine 10 is supplied to the infanticide treater 11, the pixel number of horizontal and a perpendicular direction is thinned out, and the picture of size is usually generated. The picture signal of the result pretreated in this way is supplied to the motion vector sensing device 8 and the coding equipment 9. As for drawing 4 A, (the line number of a horizontal pixel number x perpendicular direction) shows the picture of the size of

(704x480). Drawing 4 B is the picture which changed the horizontal pixel number into three fourths. Drawing 4 C is the picture which changed the horizontal pixel number into one half. Three kinds of these pictures are pictures which can usually be dealt with as size, and the pretreatment system 7 outputs one of three kinds of pictures. For example, in the case of the pixel number of drawing 4 B, the filter characteristics shown in drawing 3 A are used, and when it is a pixel number of drawing 4 C, the filter characteristics shown in drawing 3 B are used.

[0015]The motion vector sensing device 8 comprises the frame memory 12 which stores an encoding object image, and the motion detector 13 which performs inter-frame motion vector detection of a forward direction and an opposite direction. The frame memory 12 has the capacity which can store the image data of a multiple frame, and, in addition to the image data (refer to drawing 4) for the usual video compression, is considered as the composition which also stores the data for a thumbnail image in different area on a memory simultaneously. That is, the frame memory 12 has during photography both the area in which the image data of an incompressible state before recording on the recording medium one by one is once stored, and the area in which the thumbnail generated image which states later is once stored.

[0016]In the motion vector sensing device 8, the movement quantity of each frame which is time and receives for every inter-frame macro block which sets and is equivalent to a forward direction and an opposite direction is calculated. The operation which calculates the optimal motion vector value using the block matching method etc. is specifically performed, and the motion vector value is stored.

[0017]In the video compression system generally represented by MPEG (Moving Picture Experts Group). By the inter-frame direction of motion prediction at the time of asking for a motion vector, the frame which carries out interframe coding, P picture (Predictive-coded picture) by prediction of only a forward direction, It is divided into B picture (Bidirectionally predictive-coded picture) by both-directions prediction of a forward direction and an opposite direction, The frame formed into a frame inner code is I (Intra-coded picture: intra coded image). It is called a picture. B picture uses three kinds of interpolation pictures made from front already decoded I picture or P picture, I picture by which back was already decoded in time or P picture, and these both in time as an estimated image (image used as the standard which takes difference). What has the best efficiency is chosen by a macro block unit in coding of the difference after three kinds of each of this motion compensation, and intra coding.

[0018]Therefore, as a macro block type, A frame inner code-ized (Intra) macro block and the forward direction (Forward) inter-frame-prediction macro block which predicts the future from the past, There are an opposite direction (Backward) inter-frame-prediction macro block which predicts the past from the future, and a both-directions macro block predicted from order both directions. All the macro blocks in I picture are frame inner code-ized macro blocks. In P picture, a frame inner code-ized macro block and a forward direction inter-frame-prediction macro block are contained. In B picture, the macro block of four kinds mentioned above of all the types is contained.

[0019]And by MPEG, in order to make random access possible, the GOP (Group Of Picture) structure which is a settlement of the picture of two or more sheets is specified. It is prescribed to the 1st by the rule of MPEG about GOP on the bit stream that the beginning of GOP is I picture and that the last of GOP is I or P picture in order of the 2nd original image. As GOP, the structure which needs the prediction from I of the last of former GOP or P picture is also permitted. When drawing 5 sets the cycle of I and P picture to M and the number of pictures of GOP is set to N, the example of GOP of M= 3 and N= 15 is shown.

[0020]The coding equipment 9 codes such MPEG. The coding equipment 9 outputs the bit stream of the picture signal compressed through discrete cosine transform DCT device 14, the quantizer 15, and the variable-length-coding machine 16. The image data of the reference frame which decoded image data through the inverse quantization device 17 and reverse DCT device 18, and already reconstructed the output of the quantizer 15 simultaneously with it, and the adding machine 19 to add are supplied, and the output of the adding machine 19 is stored in the frame memory 20.

[0021]The motion compensation machine 21 performs a motion compensation using the motion

vector obtained with the motion vector sensing device 8 to the image data of the frame memory 20. At the time of the mode which codes the reconstructed image data by inter-frame, subtraction with the image data inputted from the pretreatment system 7 with the subtractor 22 is performed. That is, the switch 23 is connected to the a side. The switch 23 is connected to the b side at the time of the mode coded within a frame. And the bit stream outputted from the variable-length-coding machine 16 is outputted to the writing device 4 in drawing 1 via the buffer 24. The quantized control machine 25 controls the bit rate by controlling the quantization parameter performed with the quantizer 15. This control is made based on the instructions about the quantization from the compression control device 6 of drawing 1, supervising the amount of buffers in the buffer 24.

[0022]This coding equipment 9 performs a motion compensation using the motion vector value obtained with the motion vector sensing device 8, Quantization which gave weighting to the frequency axis is performed to the data which reduced the relative redundancy of the data of a time base direction, and reduced relative redundancy by conversion in the direction of a frequency axis from the space shaft orientations by DCT. And he is trying to obtain a final bit stream by performing variable length coding.

[0023]Although the above is an outline of compression coding processing over the video series of the usual image size, In addition to the above-mentioned processing generally represented by MPEG, this embodiment generates a thumbnail image simultaneously with the usual compression coding processing, The generated thumbnail image is stored in a frame memory, for example, the generated thumbnail image is read as an animation series at the time of the end of photography, compression encoding of the read thumbnail animation series is carried out, and compression coded data is recorded on the recording medium 5. As compression encoding, MPEG can for example usually be used like the picture of size.

[0024]The outline of operation of this embodiment is explained with reference to drawing 6. The result of having performed compression encoding in the usual image size is written in recording-medium, for example, optical disc, 5' one by one to the moving picture input series photoed with the video compression equipment 3. Simultaneously with this basic motion, the compression control device 6 reads one target frame picture with a fixed frame interval out of the frame memory 12 in the motion vector sensing device 8 in which the inputted image is once stored, for example, semiconductor memory. The thumbnail image which generated and generated the thumbnail image to the read target frame picture is written in the area only for a thumbnail image of the frame memory 12. These the operations of a series of are repeated.

[0025]In subsequent explanation, explanation of one embodiment of operation will be given focusing on the thumbnail image generation processing performed simultaneously with the usual compression coding processing. As an example, the input picture signal for one frame becomes horizontally [as shown in drawing 4 A] from 480 lines to 704 pixels and a perpendicular direction. The macro block which was level and it divided 16 pixels at a time perpendicularly is horizontally constituted by 44 pieces and 30 perpendicular directions in the picture of one frame. The video series inputted presupposes that they are 30 frames in 1 second.

[0026]By processing performed with the pretreatment system 7 in drawing 2 to this inputted image, the compression encoding object image data of the usual size written in the frame memory 12 in the motion vector sensing device 8, In this example, three kinds, the size shown in drawing 4 A which does not cull out horizontally, the size which are shown in drawing 4 B and which was changed 3/4 horizontally, and the size which are shown in drawing 4 C and which was changed 1/2 horizontally, will be treated.

[0027]The thumbnail image generated to the picture of such usual image sizes becomes 176 pixels and a perpendicular direction from 120 lines horizontally uniformly. A thumbnail image is equivalent to it having been level and having reduced to one fourth of sizes perpendicularly, respectively in the original inputted image. For example, a thumbnail image is generated by the thing which are shown in drawing 4 A and which subsampling of the 1 pixel is usually horizontally carried out every 4 pixels to the picture of size as shown in drawing 7 A, and is perpendicularly done for subsampling of the one line every four lines. A thumbnail image is generated by the thing which are shown in drawing 4 B and which subsampling of the 1 pixel is usually horizontally

carried out every 3 pixels to the picture of size as shown in drawing 7 B, and is perpendicularly done for subsampling of the one line every four lines. A thumbnail image is generated by the thing which are shown in drawing 4 C and which subsampling of the 1 pixel is usually horizontally carried out every 2 pixels to the picture of size as shown in drawing 7 C, and is perpendicularly done for subsampling of the one line every four lines.

[0028]Generation of such a thumbnail image is performed by accessing the frame memory 12 in the motion vector sensing device 8 in drawing 2 which usually stored size image data, as shown in drawing 8. The compression control device 6 in drawing 1 bears this. The component part about the thumbnail image generation processing of the compression control device 6 is shown in drawing 8. This component part comprises the frame memory reading processing part 26, the infanticide treating part 27, and the frame memory writing processing part 28.

[0029]During photography, the video inputted is a frame unit, is stored in seven frames prepared as area for the usual picture in the frame memory 12 one by one, and is usually processed as an object of the compression encoding of size. That is, image data is once incorporated in the frame memory 12, and compression encoding of the picture of each incorporated frame is carried out so that it may go round in order of an inputted image to the memory area for seven frames of the frame 1 – the frame 7 and the picture of each frame may be overwritten during photography at it.

[0030]In order to generate a thumbnail image, the frame memory reading processing part 26 usually reads one frame from the series of a size picture with a fixed frame interval. The read frame image is supplied to the infanticide treating part 27, level and vertical infanticide processing of being required are made in the infanticide treating part 27, and a thumbnail image is generated. A thumbnail image is written one by one in the memory area for the thumbnail images in the frame memory 12 by the frame memory writing processing part 28.

[0031]Drawing 8 shows the example which usually converts into the picture of size and uses the area for six frames for thumbnail images in the frame memory 12. To the picture of size, as shown in drawing 7 A at this time, since a thumbnail image is level and are one fourth of sizes perpendicularly, it puts in order and writes four thumbnail images at a time in level and a perpendicular direction, and can usually do things. That is, the thumbnail image for a total of 16 frames can usually be written in the area for one frame with image size. Therefore, as shown in drawing 9, the thumbnail image for a total of 96 frames is stored in the area for thumbnail images for six frames of the frame memory 12.

[0032]Next, the operation which extracts one frame of an inputted image with the fixed frame interval adopted by this embodiment which the compression control device 6 of drawing 1 manages, and performs thumbnail image generation is explained. First, the maximum frame number (the maximum number of sheets) which can be written in the area of the frame memory currently prepared for thumbnail images in this example is 96 sheets as mentioned above. Then, as shown in drawing 10, the target frame which generates a thumbnail image out of an inputted image is extracted with a fixed frame interval from the head of a photographing start frame.

[0033]In drawing 10, it is the example which extracts one frame every ten frames and is carrying out thumbnail image generation from each extracted frame. Therefore, the frame image of three sheets is sampled from 30 for 1 second. In such an example, the compression control device 6 of drawing 1 accesses the usual size image data in the frame memory 12 with 10 frame intervals, and performs processing which stores in order the thumbnail image which generated and generated the thumbnail image in the frame memory 12.

[0034]The bit stream produced during photography by usually carrying out compression encoding of the video of size one by one is recorded on recording media, such as optical disc 5', by real time, and the thumbnail image simultaneously generated in the process is read from the thumbnail image area in the frame memory 12 at the time of the end of photography. By it, the list of the photographing contents by a thumbnail image series is attained. For example, the inspection of the contents is attained by usually reading the image frame unit of size, i.e., the 16-sheet unit of a thumbnail image. The picture in this case is displayed as a still picture of the screen of 16 division as shown in drawing 9.

[0035]This one embodiment generates an animation series instead of the still picture by a

thumbnail image. That is, an animation series is generated by outputting to the time order which is the time interval extracted out of the inputted image series, and wrote in every one sheet of the thumbnail image stored in the frame memory 12 at the time of the end of photography. The bit stream of a thumbnail animation is generated by carrying out compression encoding of the thumbnail video series, and it records on a recording medium. However, in order to double with the temporal change of the photoed original inputted image, when displaying 30 frames in 1 second, compression encoding is carried out so that the display of the thumbnail image of ten-frame one sheet equivalent to the extracted frame interval may be repeated.

[0036]When performing compression encoding, the thumbnail image of one sheet can be encoded as an I picture like ten frames. In that case, a code amount will increase. So, as shown in drawing 11, when one frame is extracted every ten frames and a thumbnail image is generated. One frame of a thumbnail image is made into I picture, compression encoding is carried out, the value of a motion vector is 0 in all the macro blocks, and the difference value of the forward direction prediction by the motion vector also codes each nine frames following it to P picture of 0 by all the macro blocks. By it, the picture of nine frames is made with the picture of the frame processed as a last I picture, and the completely same picture. That is, a code amount is held down to minimum by generating a kind of frame copy intentionally. In this case, the bit stream of (N= 10) is formed [the cycle of I or P picture] for the number of pictures of GOP by (M= 1).

[0037]The animation stream of the thumbnail image formed in this way is recorded to the recording medium 5 or other recording media. The animation series by a thumbnail image is generable for realizing a to some extent smooth motion only by dropping a frame rate (frame number of sheets for 1 second) on the case of this example compared with the usual picture.

[0038]An example of operation of the compression control device 6 (drawing 1) in this one embodiment is explained. As an example, an inputted image is extracted with a constant interval during one photography, and the processing for generating an animation thumbnail is explained.

[0039]Drawing 12 is a flow chart which shows operation of the compression control device 6. First, if a photographing start, i.e., encoding compression coding processing, is started first, in Step S1, encoding of the usual size picture of a video series inputted one by one will be performed, and the bit stream of the result by which compression encoding was carried out will be recorded on recording media, such as an optical disc. Thumbnail image generation processing performed simultaneously with this usual compression coding processing is performed until encoding is completed. In Step S2 of a judgment of whether to end, when not being an end still is determined, the frame number of an inputted image is counted (Step S3).

[0040]It is judged following Step S3 whether the present processing frame is a frame of the fixed frame interval cycle from a start frame including a photographing start frame (step S4). Here, when judged with the frame of a constant interval, in Step S5, a thumbnail image is generated to the frame. When that is not right, it returns to Step S1 by no processing.

[0041]And it becomes the end of photography, and in Step S2, if it judges with the encoding processing of image size usually having been completed, processing of Step S6 will be made. In Step S6, as mentioned above, the thumbnail image written to the thumbnail image area in the frame memory 12 is cut down per frame, and is encoded as one thumbnail video series, and the bit stream of the result is recorded on recording media, such as an optical disc. When record of the bit stream of the thumbnail image is completed, all the operations are also ended.

[0042]The thumbnail image generation by the above operation contains a photographing start frame, The bit stream which existed and carried out compression encoding to the relation with the inputted image which generates the thumbnail image of one sheet every 10 frame intervals from a start frame as shown in drawing 10, and withered in writing in the recording medium is expressed as a video series as shown in drawing 11, when extension decryption is carried out.

[0043]By thus, the thing for which the compression control device 6 of drawing 1 performs the above processing in one embodiment of this invention. When the thumbnail image is simultaneously stored in the frame memory and photography was completed, carrying out compression encoding of the usual video, and recording a bit stream on recording media, such as an optical disc, one by one, It is made as [record / carry out compression encoding of the thumbnail image, and / shortly, / on a recording medium / the bit stream].

[0044]Next, if 1 time of exposure time is long when the frame number of sheets of the thumbnail image which can be stored in the frame memory 12 which exists in the compression equipment 3 like one embodiment is limited, a case so that the frame number of a thumbnail image may exceed the maximum thumbnail number of sheets will arise.
[0045]In such a case, when it receives, nothing copes with it and the area in the frame memory 12 in which a thumbnail image is stored by one photography fills, control which stops compulsorily generation and the writing to a frame memory of a thumbnail image is performed. While being under photography, although this is the easiest processing, a thumbnail image will not exist [to] in order to peruse the contents photoed later.
[0046]Then, a technique which is described below is more preferred. It overwrites a new thumbnail image on the thumbnail image once written in in order 1-96 as shown in drawing 13, when the number of sheets of the thumbnail image generated during photography exceeds the number of sheets of the maximum thumbnail image. A slash is attached and drawing 13 shows the frame overwritten. However, the overwrite in that case is always made to the thumbnail image series on the frame memory 12 as [carry / at the beginning / only to the area of the thumbnail image written in eye even frame watch].
[0047]That is, to the map of the thumbnail image written on the frame memory 12 as shown in drawing 13 the row of a thumbnail video series, If eye odd frame watch wrote in first is read in order and the thumbnail image of the last on the frame memory 12 is reached, it will be reading shortly the thumbnail image of the eventh frame rewritten at the 2nd times in order, and it will become possible to make the animation thumbnail series of twice [about] as many exposure time **** as this. In this case, although time to be twice the frame interval of the thumbnail image generated of this comes and the density of a contents inspection falls, the contents of a thumbnail under one photography can be prepared till the end of photography.
[0048]The example of composition for reproducing the thumbnail image generated as mentioned above is shown in drawing 14. Usually, the picture and thumbnail image of size are equivalent to the reversion system in a common MPEG system. A bit stream is read in the recording medium 5 with the reader 31, the read bit stream is decrypted with the decoding device 32, and a picture signal is generated by passing the aftertreatment apparatus 33. A picture signal is changed into an analog picture signal by D/A converter 34, and is displayed with the display 35.
[0049]As a dashed line surrounds and shows the decoding device 32, the bit stream from the reader 31 is supplied to the buffer 41. The output of the buffer 41 is supplied to the decryption machine 42 of a variable length code, and the decoding processing of a variable length code is made. The output of the variable-length decryption machine 42 is supplied to the inverse quantization device 43, and processing contrary to the quantization processing at the time of record is made. The output of the inverse quantization device 43 is supplied to the adding machine 45. The picture signal decoded by the output of the adding machine 45 is taken out.
[0050]The decoding output from the adding machine 45 is supplied to the frame memory 46 and the motion compensation machine 47. The frame memory 46 once accumulates the decoded picture signal. The motion compensation machine 47 performs a motion compensation using the motion vector separated in the variable-length decryption machine 42. The output of the motion compensation machine 47 is a decoded image signal of a previous frame, and a decoded image signal is supplied to the adding machine 45, and is added with the output of reverse DCT device 34.
[0051]The decoded image signal from the adding machine 45 is supplied to the interpolation treater 48 of the aftertreatment apparatus 33. The filter arithmetic machine 49 is connected to the interpolation treater 48. The aftertreatment apparatus 33 performs processing contrary to pretreatment at the time of record, and the decoded image of the original pixel number is supplied to D/A converter 34 from the aftertreatment apparatus 33.
[0052]The thumbnail video series generated by this invention is shown in drawing 11, and MPEG compression is carried out to it being also at a frame interval which was mentioned above. Therefore, MPEG decoding under expansion process is made by the usually same processing as the image of size. How the decoded thumbnail video series is displayed can adopt some methods by composition of apparatus.

[0053]One method is displayed on the displays 35, such as a CRT monitor and a flat display, as an animation with the size to which the thumbnail image was reduced. Other methods expand a thumbnail image and display it on the whole screen. Since the method of expanding and displaying has the problem that resolution is low, the method of displaying as an animation of the reduced size (small screen) is a main thing. However, if it is a size of the display screen about [attached to a video camera] a liquid crystal display monitor, it is also possible to display the expanded thumbnail image.
[0054]A split display as shown in drawing 9 is also possible. In that case, the structure which elongates and displays the MPEG compressed data of a thumbnail video series is usually somewhat different from decoding and a display of the image of size. In a decoding process, the processing which extracts only I picture out of MPEG data, and is displayed on a screen separation position is needed. The portion made into P picture is cut on a display.
[0055]In one embodiment mentioned above, after generating the thumbnail image of a non-compression state and completing photography by the usual image size one by one on the frame memory 12, are performing compression encoding about a thumbnail image, and record to a recording medium, but. In the system by which processing speed also including thumbnail image generation and its compression encoding is fully obtained, Simultaneously with photography of image size, in one photography, compression encoding of the thumbnail image is usually carried out, The obtained compression coded data (bit stream) is stored on the frame memory 12, compression coded data may be read from the frame memory 12 at the time of the usual end of photography, and it may record on a recording medium.
[0056]In addition to thumbnail image generation and its compression encoding, in the system by which processing speed also including record to a recording medium is obtained, the bit stream compression state which was usually acquired by carrying out compression encoding of the thumbnail image simultaneously with photography of image size may be recorded on a recording medium.
[0057]Although what set size of the thumbnail image to one fourth to level and the perpendicular direction of the original inputted image, respectively is treated in one embodiment, it is not necessary to restrict to this size, and it has a meaning that it is small size suitable for perusing the contents of the photography video series. In order level and to simplify vertical processing, are generating the thumbnail image only by simple infanticide processing of the pixel and the line, but, It is also possible to perform infanticide processing used together with conversion of the frequency characteristic by a digital filter like the pretreatment system 7 in one embodiment, and to perform more advanced thumbnail image generation.
[0058]In one embodiment, in generation of the thumbnail image for every fixed frame interval, although that frame interval is explained as ten frames, it is not necessary to restrict to this value.
[0059]Although it has realized more nearly further at one embodiment by preparing the area only for a thumbnail image in addition to the storage area of the usual image size on the frame memory certainly contained in the video compression equipment generally represented by MPEG etc. as what stores a thumbnail image, Even if it does not restrict but stores on recording media, such as external semiconductor memory, it is the same as that of the memory in a compression equipment.
[0060]DRAM which has a storage capacity of general-purpose 64Mbit by this embodiment as the frame memory 12 which exists in a compression equipment is adopted, When seven frames of an inputted image (704 pixels, 480 lines) are usually used as indispensable frame number of sheets for the video compression encoding of size, The total number of thumbnail image frames which can carry out the maximum reservation on the remaining memories as an object for the thumbnail images of above-mentioned size (176 pixels, 120 lines) will be about 140 frames.
[0061]Although the data of the bit stream in which image size usually carried out compression encoding is also recording both of the bit stream which carried out compression encoding of the thumbnail image on recording media, such as an optical disc, in this embodiment, Since there is little data volume about the data which the thumbnail image compressed, it can also transmit to communication lines, such as the Internet, directly. That is, the picture with small size like a

thumbnail image can also be sent out to communication, recording a high definition image on recording media, such as an optical disc.

[0062]

[Effect of the Invention]According to this invention, it becomes possible to generate automatically the thumbnail image extracted from those image sequences simultaneously with record to the recording medium of the usual video camera so that clearly from the above explanation. That is, if it sees from a user, when the usual video photographing is carried out, almost as soon as the one photography is completed, the video series by the thumbnail image used as the outline of the shot can be being created. Therefore, when it becomes unnecessary to newly take the procedure of thumbnail generation later and reproduces later, the outline of a photographing content can be easily grasped by referring to a thumbnail animation series.

[0063]Since the thumbnail video automatically generated by this invention has less data volume than the data of the usual image size recorded on a recording medium, it can also be sent, for example in the form of application like a video mail on communication media, such as the Internet, as it is.

[0064]Although this invention is realized, what is necessary is just to increase capacity required for the area for thumbnail animation generation to the capacity of a memory indispensable to the usual animation encoding, and there is an advantage to which the scale of hardware does not increase.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of one embodiment of this invention.
[Drawing 2]It is a block diagram showing the more detailed composition of the principal part of one embodiment of this invention.
[Drawing 3]It is an approximate line figure showing the characteristic of the filter of the pretreatment system in one embodiment of this invention.
[Drawing 4]It is an approximate line figure in one embodiment of this invention usually showing the example of the size of a picture.
[Drawing 5]It is an approximate line figure for explaining an example of the compression encoding in one embodiment of this invention.
[Drawing 6]It is a block diagram showing the rough composition of one embodiment of this invention.
[Drawing 7]It is an approximate line figure for explaining the size of the thumbnail image in one embodiment of this invention.
[Drawing 8]It is a block diagram for explaining the thumbnail image generation processing in one embodiment of this invention.
[Drawing 9]It is an approximate line figure for explaining the frame arrangement for thumbnail images on the memory in one embodiment of this invention.
[Drawing 10]It is an approximate line figure for explaining the frame interval of the thumbnail image generation in one embodiment of this invention.
[Drawing 11]It is an approximate line figure for explaining the composition of the thumbnail video series in one embodiment of this invention.
[Drawing 12]It is a flow chart for explaining the thumbnail image generation processing in one embodiment of this invention.
[Drawing 13]It is an approximate line figure for explaining the frame arrangement for thumbnail images on the memory in one embodiment of this invention.
[Drawing 14]It is a block diagram showing the example of composition for reproducing the thumbnail image generated by one embodiment of this invention.
[Description of Notations]
1 [... A compression control device, 7 / ... A pretreatment system, 8 / ... A motion vector sensing device, 9 / ... Coding equipment, 26 / ... A frame memory reading processing part, 27 / ... An infanticide treating part, 28 / ... Frame memory writing processing part] ... An imaging device, 3 ... A compression equipment, 5 ... A recording medium, 6

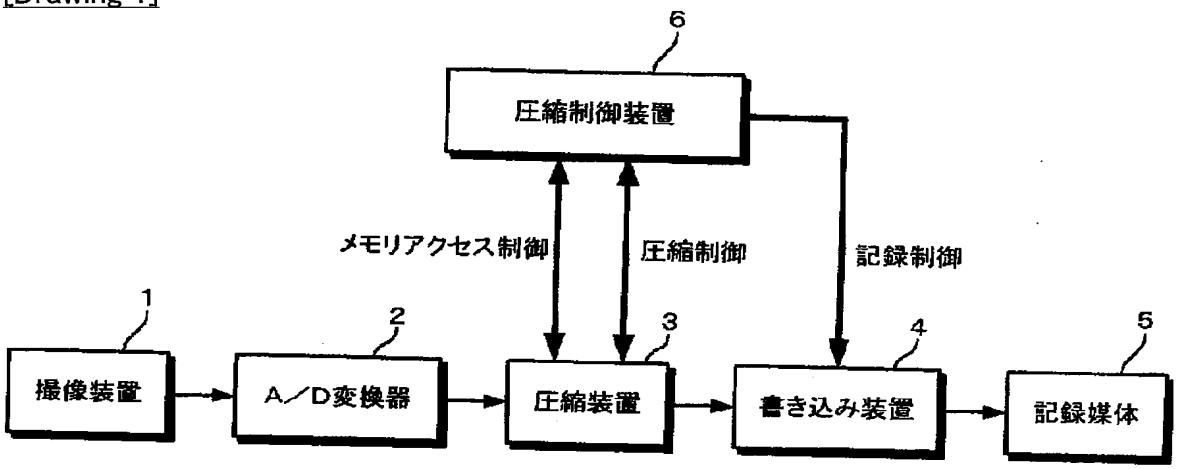
[Translation done.]

* NOTICES *

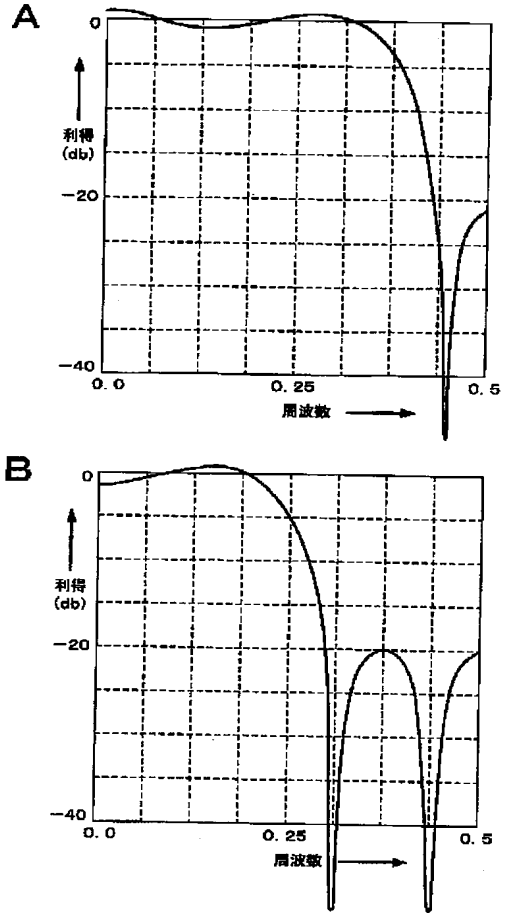
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

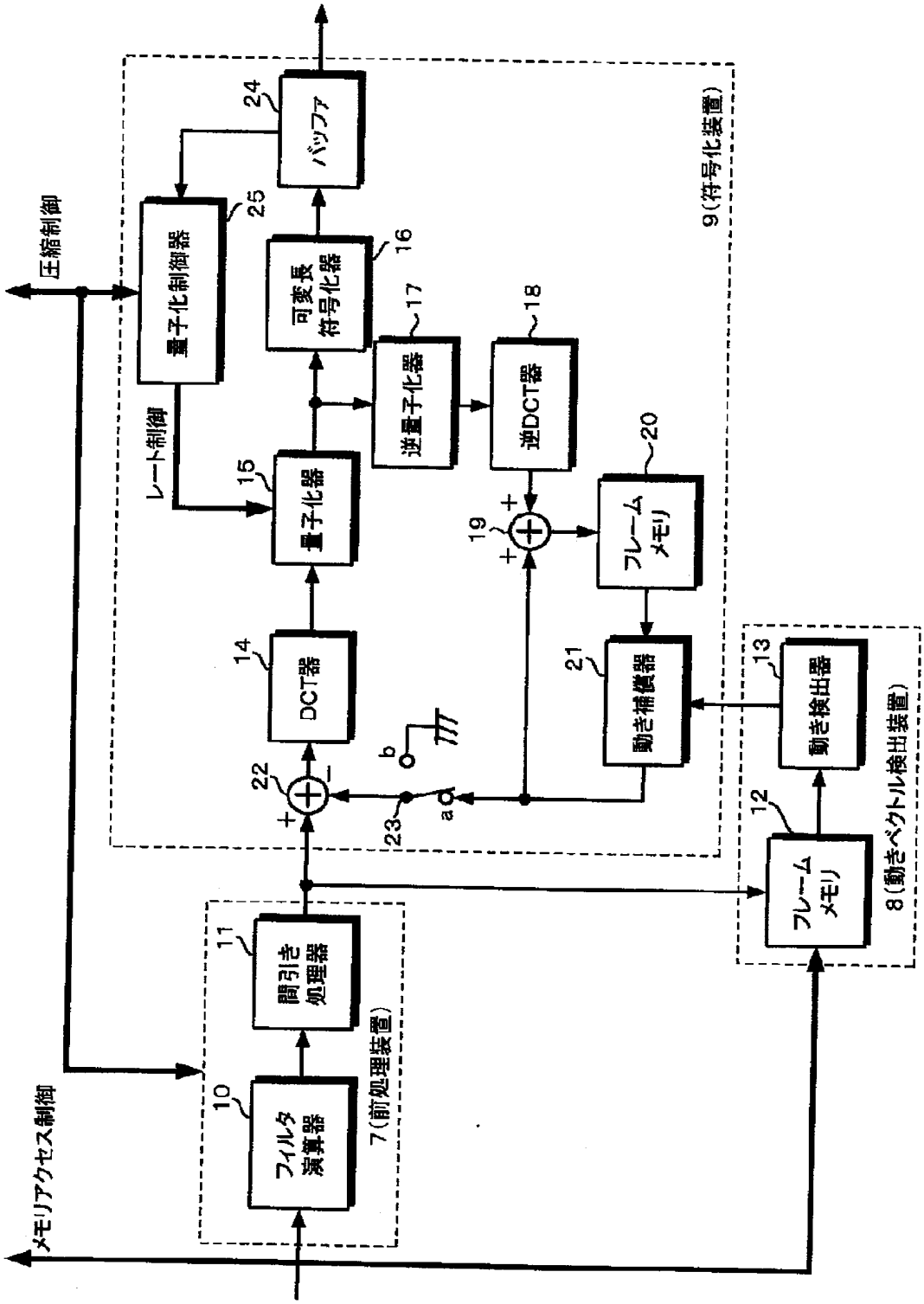
[Drawing 1]



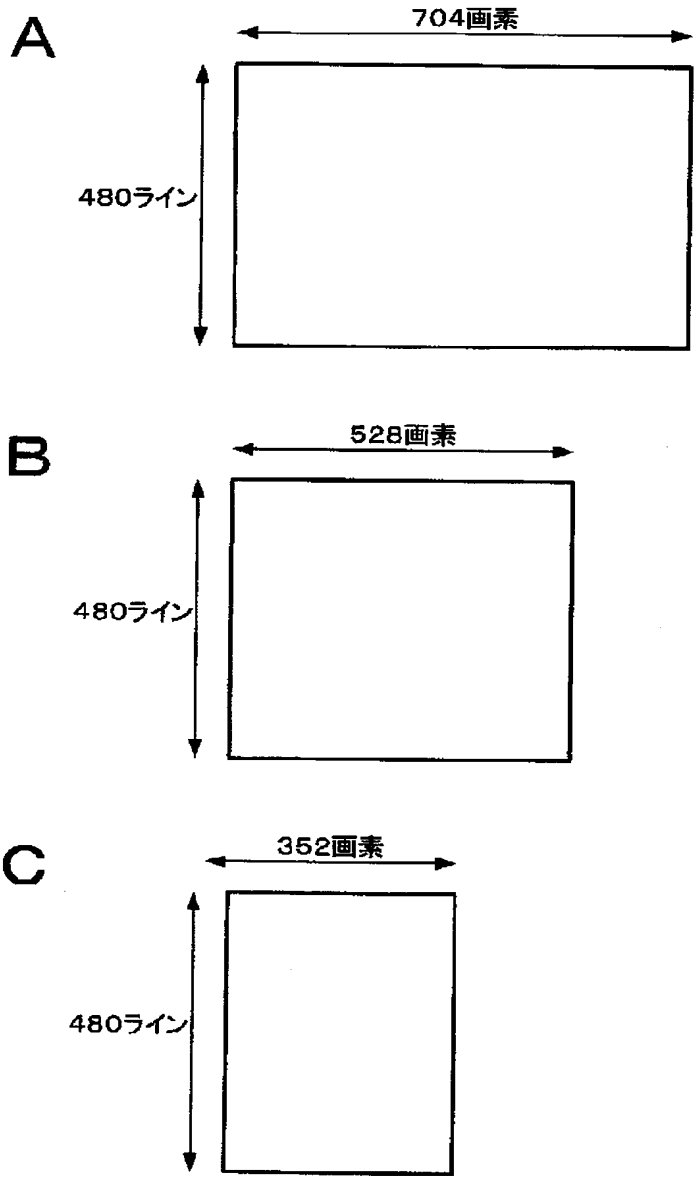
[Drawing 3]



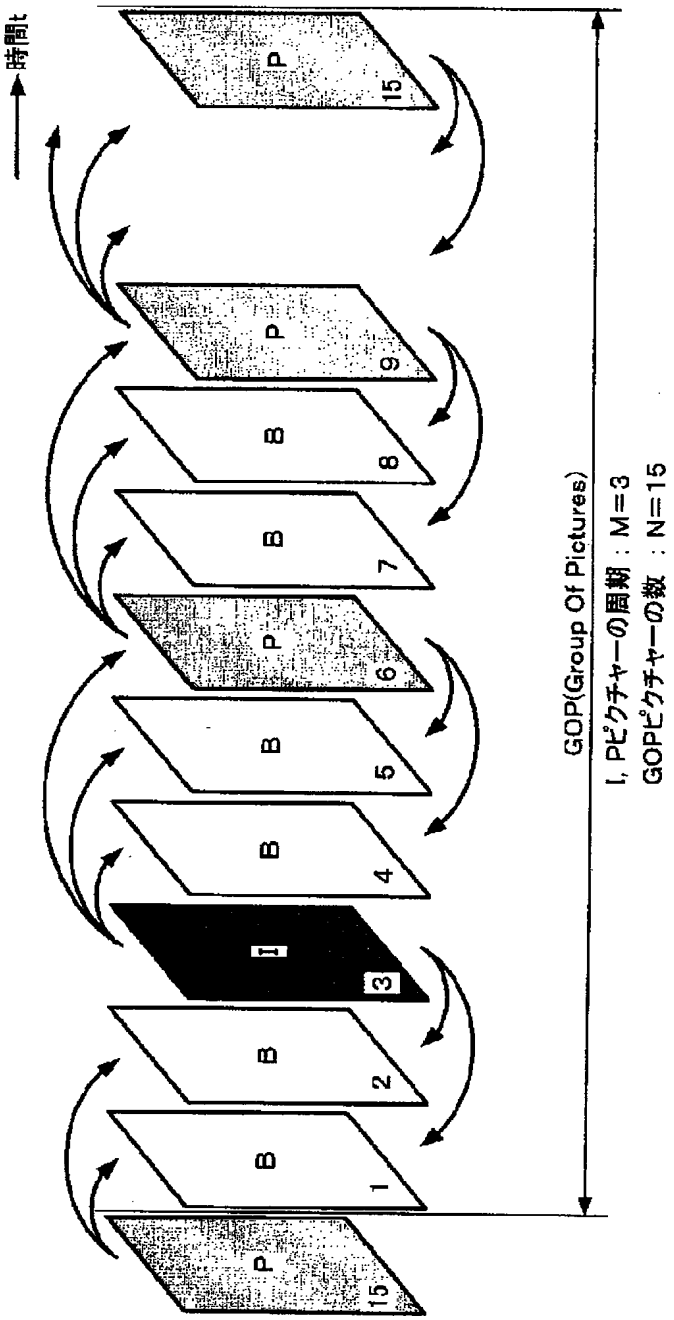
[Drawing 2]


圧縮制御
メモリアクセス制御
9(符号化装置)
8(動きベクトル検出装置)
7(前処理装置)
24 バッファ
25 量子化制御器
16 可変長符号化器
17 逆量子化器
18 逆DCT器
20 フレームメモリ
19
15 量子化器
レート制御
14 DCT器
21 動き補償器
13 動き検出器
22
23
12 フレームメモリ
11 間引き処理器
10 フィルタ演算器
a
b

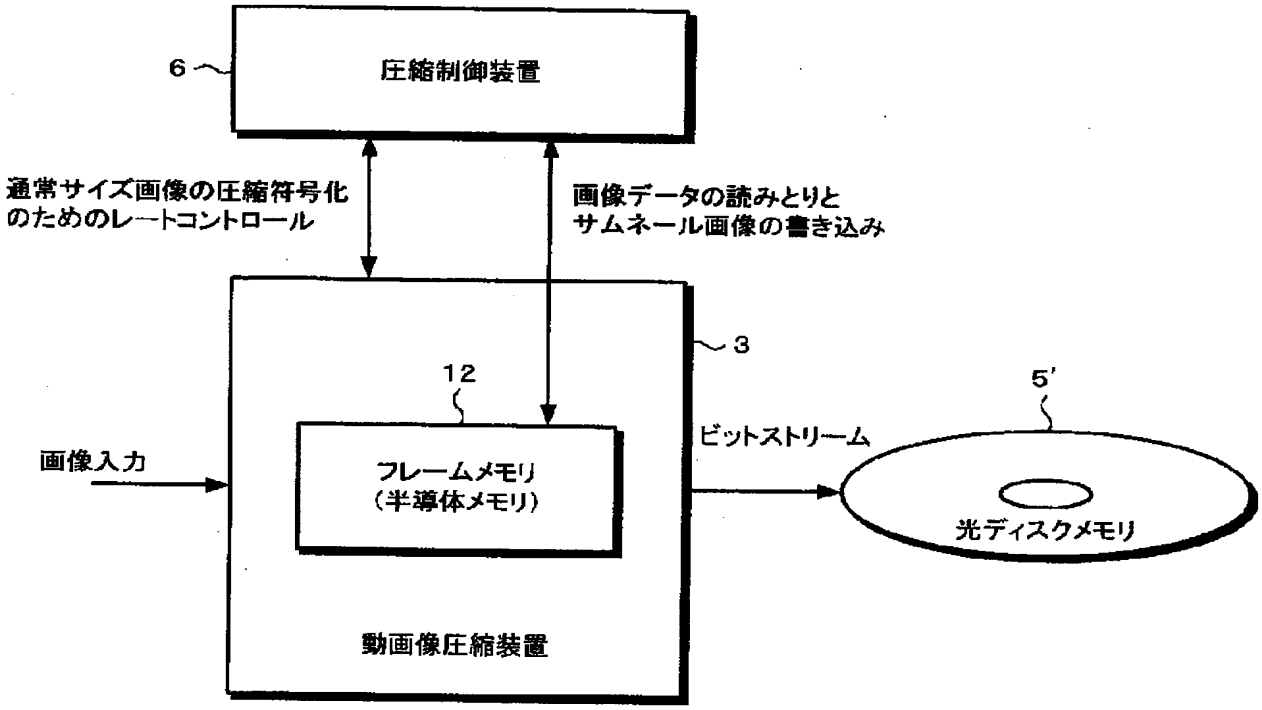
[Drawing 4]



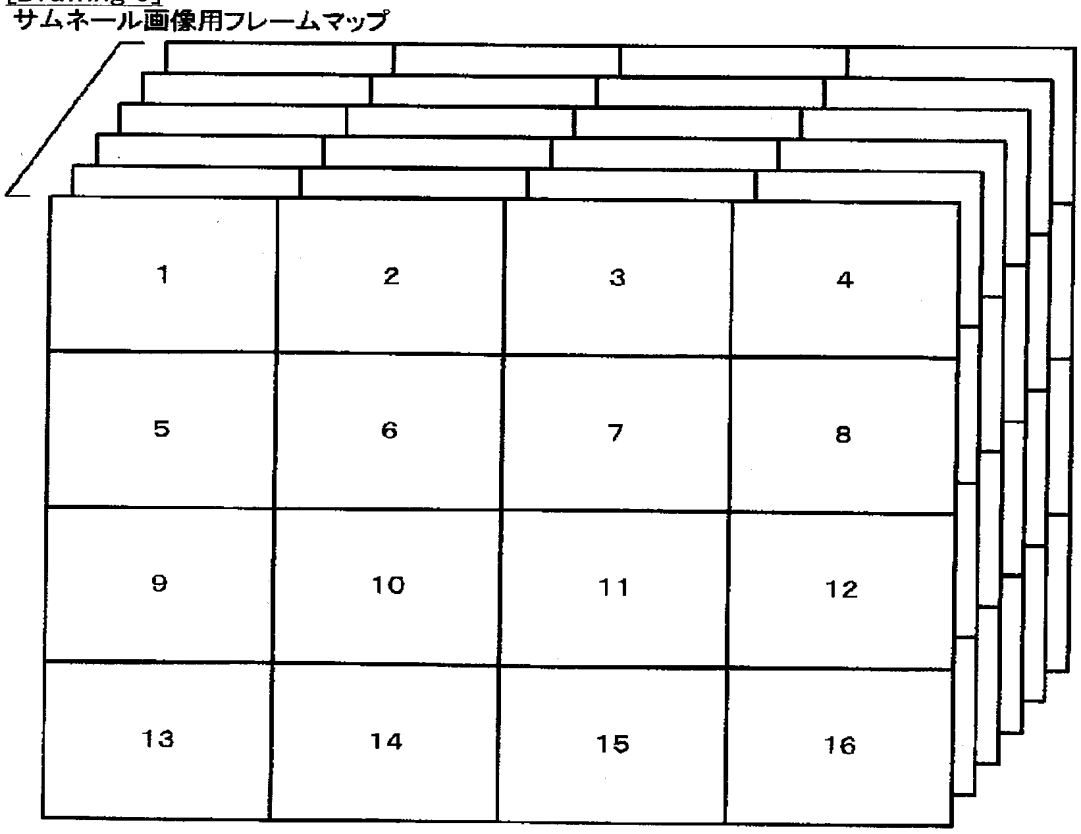
[Drawing 5]


時間t
P 15
P 9
B 8
B 7
P 6
B 5
B 4
I 3
B 2
B 1
P 15
GOP(Group Of Pictures)
I, Pピクチャーの周期：M=3
GOPピクチャーの数 ：N=15

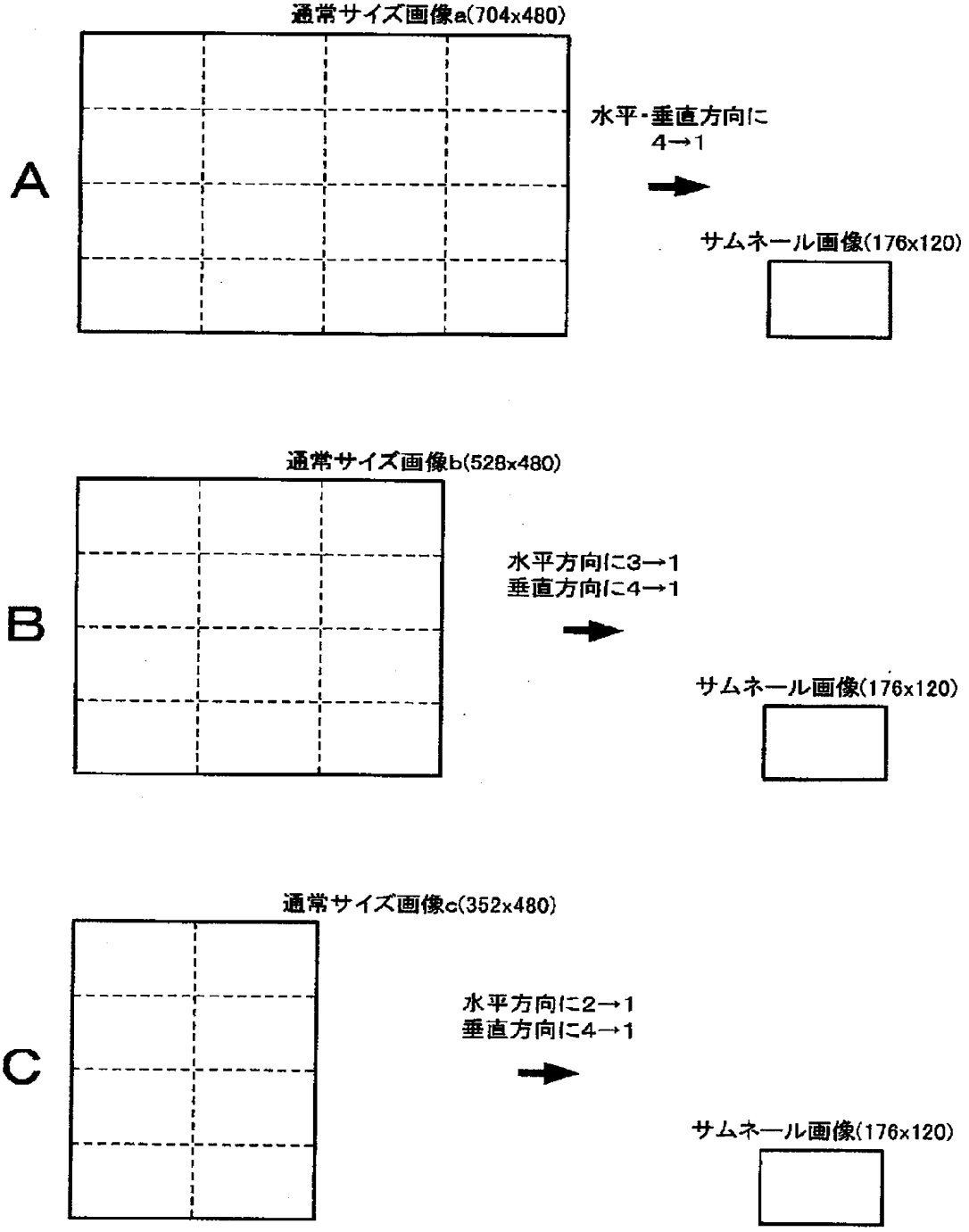
[Drawing 6]



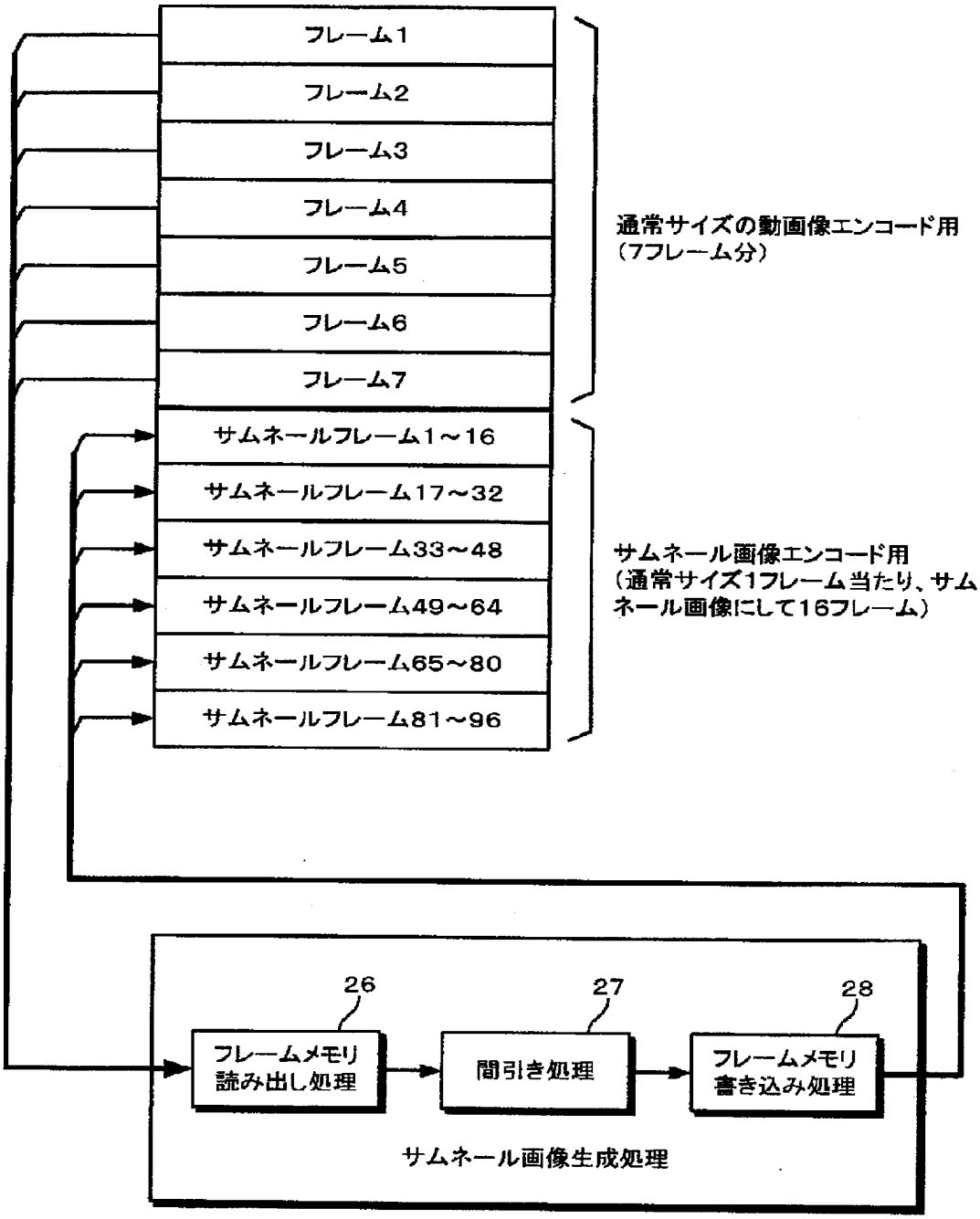
[Drawing 9]



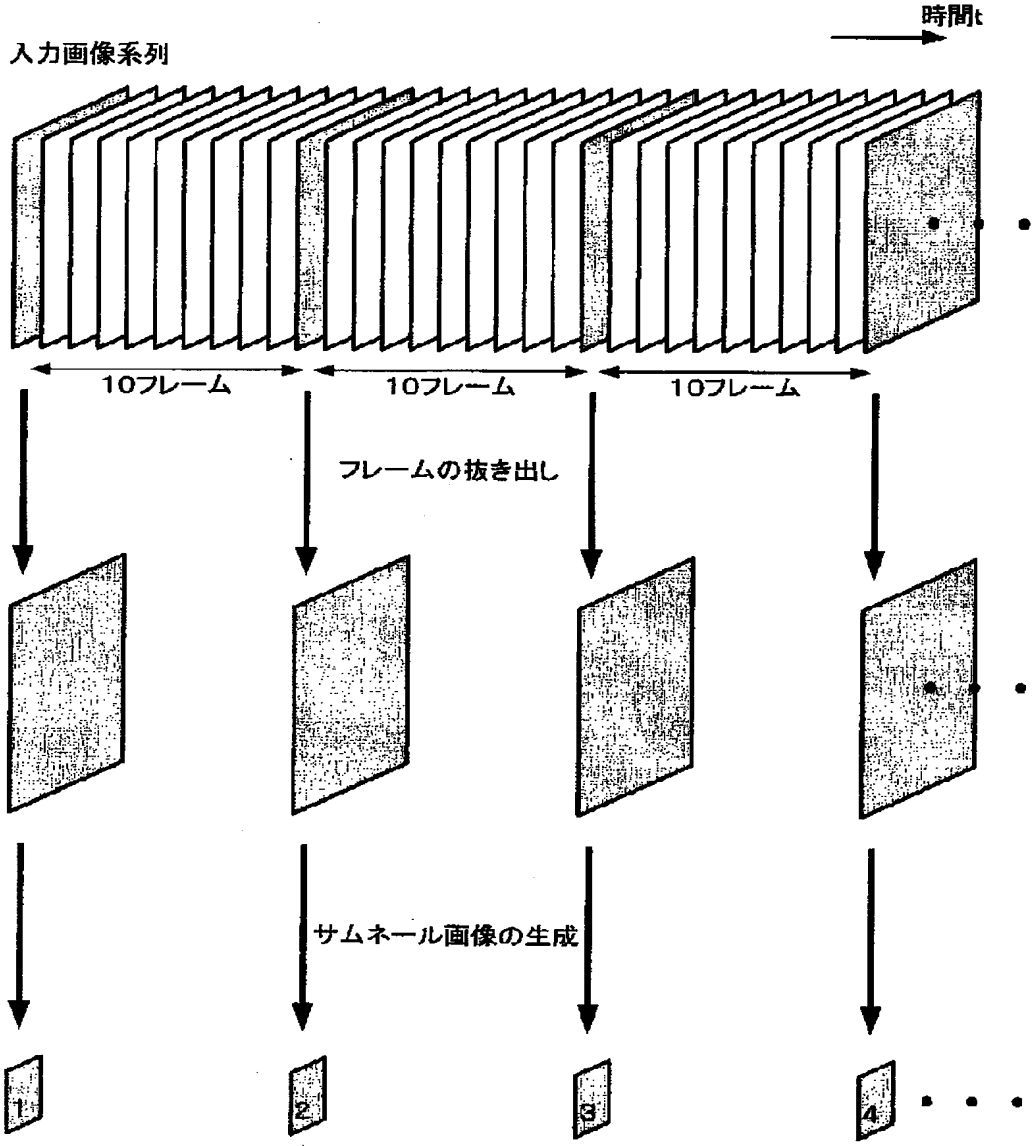
[Drawing 7]


通常サイズ画像a(704x480)
A
水平・垂直方向に
4→1
サムネール画像(176x120)
通常サイズ画像b(528x480)
B
水平方向に3→1
垂直方向に4→1
サムネール画像(176x120)
通常サイズ画像c(352x480)
C
水平方向に2→1
垂直方向に4→1
サムネール画像(176x120)

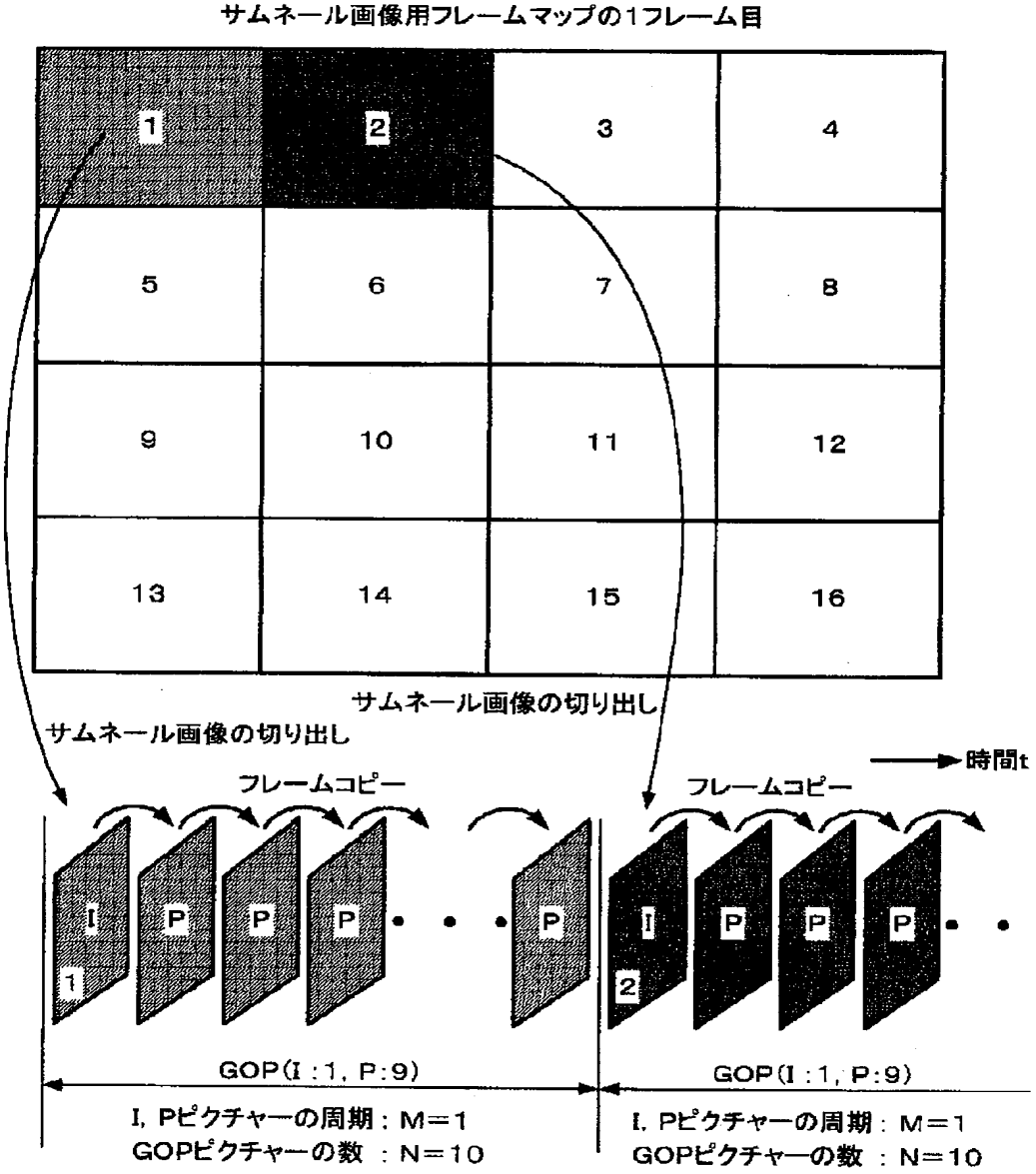
[Drawing 8]


フレーム1
フレーム2
フレーム3
フレーム4
フレーム5
フレーム6
フレーム7
通常サイズの動画像エンコード用
（7フレーム分）
サムネールフレーム1～16
サムネールフレーム17～32
サムネールフレーム33～48
サムネールフレーム49～64
サムネールフレーム65～80
サムネールフレーム81～96
サムネール画像エンコード用
（通常サイズ1フレーム当たり、サムネール画像にして16フレーム）
26
27
28
フレームメモリ読み出し処理
間引き処理
フレームメモリ書き込み処理
サムネール画像生成処理

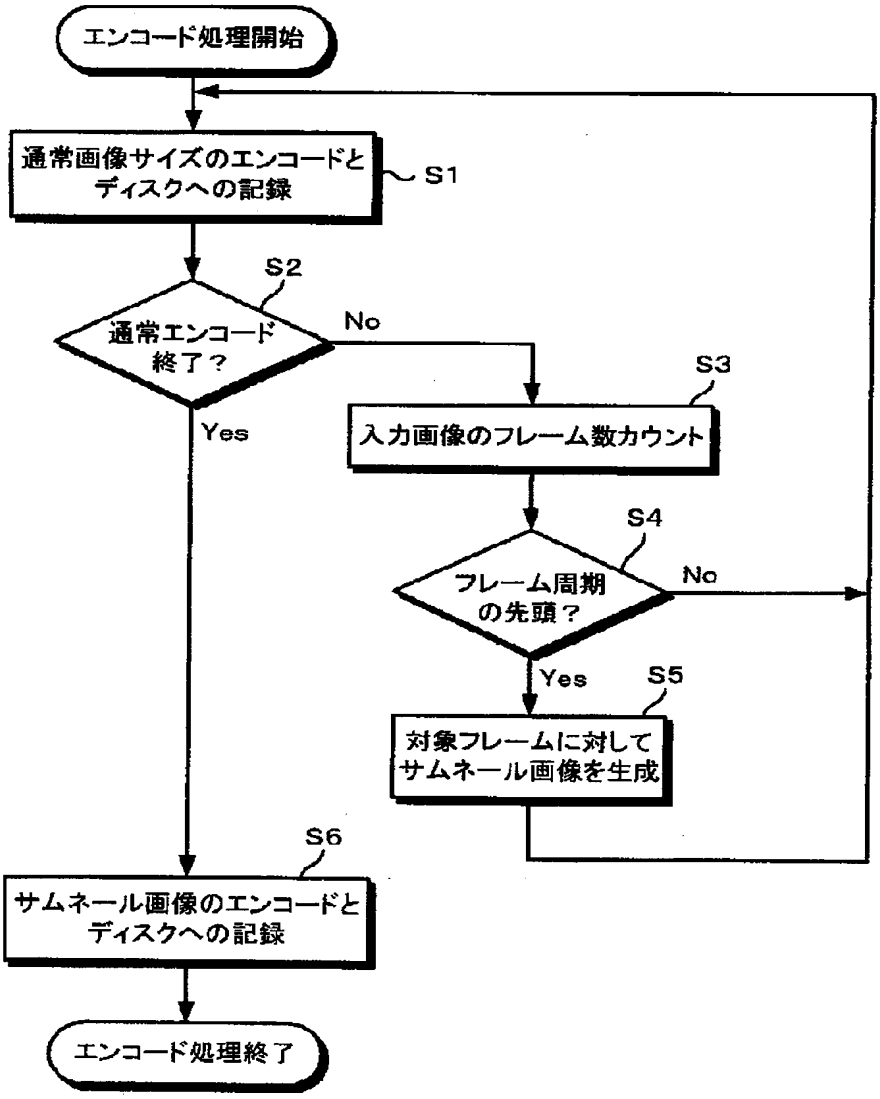
[Drawing 10]


時間t
入力画像系列
10フレーム
10フレーム
10フレーム
フレームの抜き出し
サムネール画像の生成
1
2
3
4

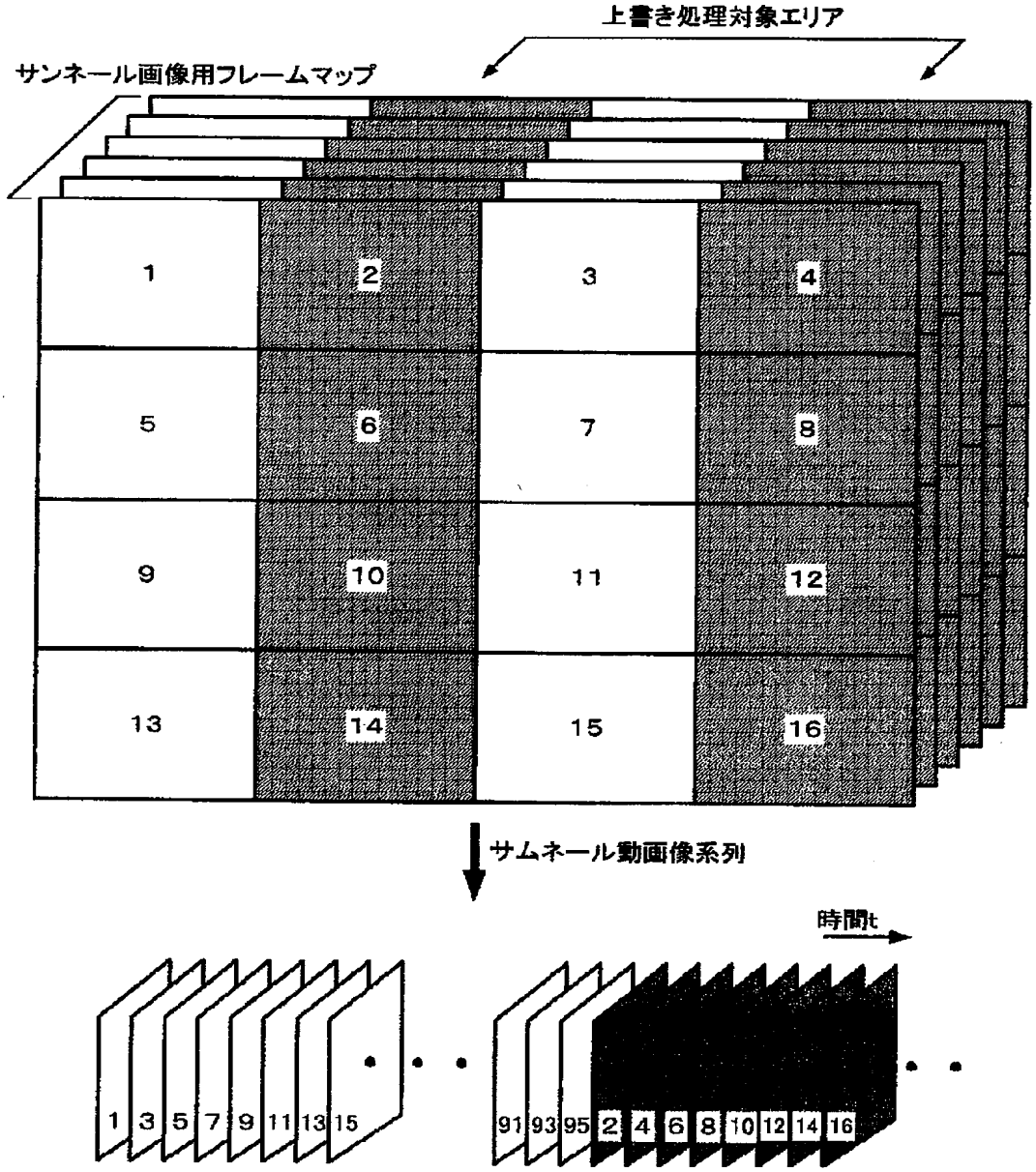
[Drawing 11]


サムネール画像用フレームマップの1フレーム目
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
サムネール画像の切り出し
サムネール画像の切り出し
時間t
フレームコピー
フレームコピー
I
P
P
P
P
I
P
P
P
1
2
GOP(I:1, P:9)
GOP(I:1, P:9)
I, Pピクチャーの周期：M=1
GOPピクチャーの数 ：N=10
I, Pピクチャーの周期：M=1
GOPピクチャーの数 ：N=10

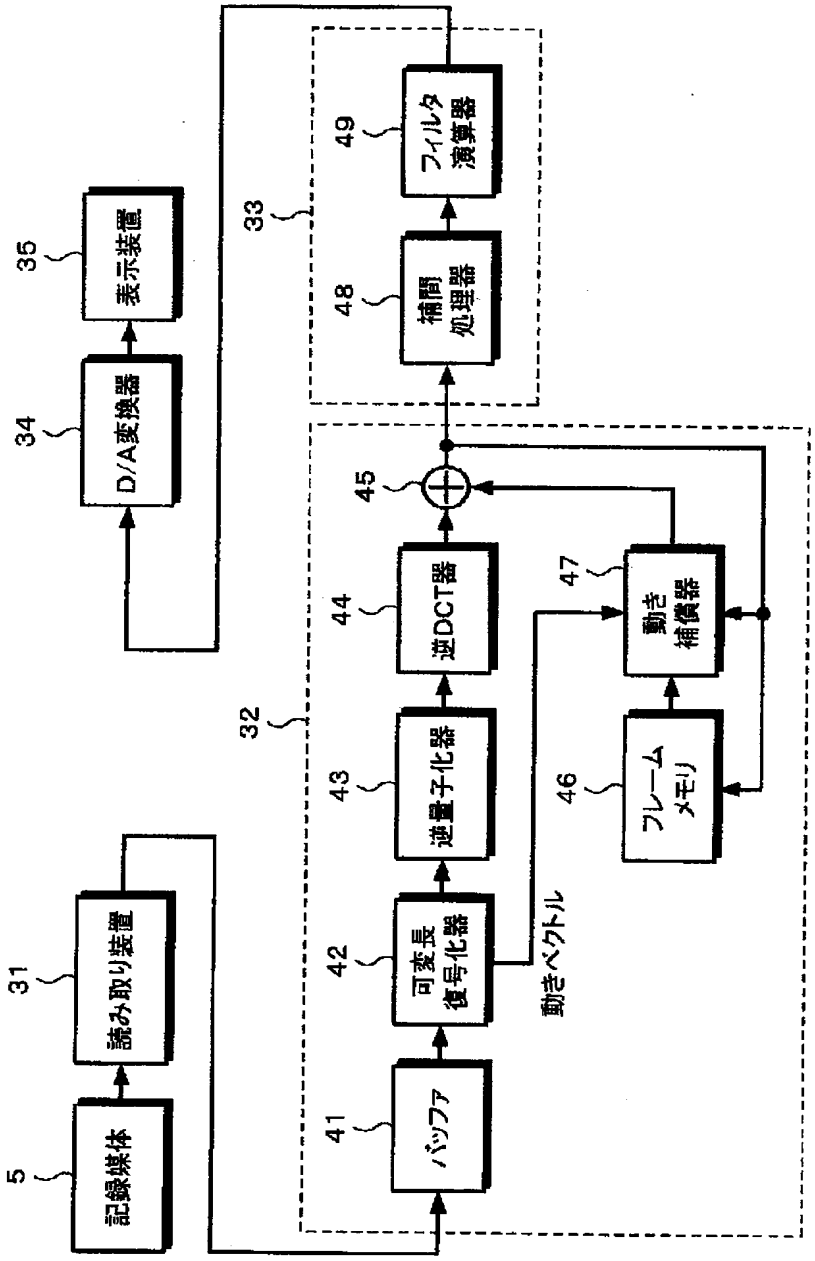
[Drawing 12]


エンコード処理開始
通常画像サイズのエンコードとディスクへの記録
S1
S2
通常エンコード終了？
No
Yes
S3
入力画像のフレーム数カウント
S4
フレーム周期の先頭？
No
Yes
S5
対象フレームに対してサムネール画像を生成
S6
サムネール画像のエンコードとディスクへの記録
エンコード処理終了

[Drawing 13]


上書き処理対象エリア
サンネール画像用フレームマップ
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
サムネール動画像系列
時間t
1 3 5 7 9 11 13 15
91 93 95 2 4 6 8 10 12 14 16

[Drawing 14]



[Translation done.]